



Sustainable urban transformation and sustainability transitions; conceptual framework and case study



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ABSTRACT

The objective of urban sustainability requires sustainable urban transformation (SUT), which is closely related to urban sustainability transitions. This paper contributes to the knowledge and discussion on these fields in two ways. First, it defines SUT as a subset of urban sustainability transitions, consisting of 1) sustainable places and their management and usage, 2) the sustainability transition of the urban development regime and 3) sustainability transitions in related societal sectors. Normative societal goals for both the urban development regime and sustainable urban areas are incorporated in this definition. Second, it describes transition patterns in the complex transformation process of the Rijnhaven area (Rotterdam, The Netherlands), and relates the process to transition literature.

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1. Introduction

It has been widely accepted that global sustainability is for an important part an issue of urban sustainability (see for example Bugliarello, 2006; Walsh et al., 2006). Urban sustainability requires realizing sustainable urban places (Picket et al., 2013; Meijer et al., 2011; Quitzau et al., 2013). Realizing sustainable urban places is part of sustainable urban transformation (SUT), which encompasses both sustainable urban structures and environments and (radical) economic, social, cultural, organizational, governmental and physical change processes (Camagni, 1998; McCormick et al., 2013). There are yet few examples of actual sustainable urban developments (Meijer et al., 2011; Klein Woolthuis et al., 2013; McCormick et al., 2013). This paper aims to create a better understanding of SUT to help realize urban sustainability.

SUT relates to a multitude of urban sustainability issues, ranging from poverty, over-population, unhealthy housing conditions, inadequate infrastructure, hygienic problems, poor water quality and uncontrolled pollution in developing countries to segregation

and growing social tensions, local traffic problems, solid waste generation and the large consumption of energy and material in developed countries. These problems are multi-level and multi-scale and are related to global climate change and ecological, environmental and resource problems (McCormick et al., 2013). These challenges are enhanced by the nature of cities themselves, that imply large scales, context-dependencies, inertia of built environment and complex socio-spatial structures (Næss and Vogel, 2012; De Graaf and Van der Brugge, 2010), and interrelated environmental, socio-cultural, economic, political, institutional and physical features (Wamsler et al., 2013). Realizing urban sustainability can be considered a wicked problem: there is no right or wrong solution, requirements keep changing, complex interdependencies play a role, there is little opportunity to learn by trial and error, and every implemented solution requires significant investments and causes high risks. Due to the life span of urban developments, negative consequences cannot easily be undone (Klein Woolthuis et al., 2013; see also Frantzeskaki et al., 2014). These problems require urban sustainability transitions: purposive, systemic, long-term and vision-led change towards sustainability in the incumbent complex of urban practices, technologies, infrastructures, markets and institutions that determine patterns of production and consumption of resources and require long-term

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oriented governance approaches and flexible, adaptive and reflexive policy designs that emphasize deliberation, probing, experimentation and learning (Hamann and April, 2013; Nevens et al., 2013; Van den Bergh et al., 2011). SUT, which deals with sustainable places and processes, is therefore closely related to urban sustainability transitions.

Literature provides extensive knowledge on sustainability transitions, and in it place specificity is increasingly considered an important topic (Coenen et al., 2012; Hansen and Coenen, *in press*; Hodson and Marvin, 2010; Raven et al., 2012). Transition literature shows different perspectives to realizing sustainable urban places. First, realizing sustainable urban places can be the object of sustainability transitions (Næss and Vogel, 2012); what Frantzeskaki and Loorbach (2010) call an infrasystem transition. Second, urban places can be subject to sustainability transition initiatives (Hamann and April, 2013; Hodson and Marvin, 2010; Quitzau et al., 2013), for example the ‘roof transition’, in which traditional mono-functional roofs are being replaced by sustainable, multi-functional roofs (Loorbach and Rotmans, 2010). Third, realizing sustainable urban places is closely related to the sustainability transition of the urban development regime (Peek and Troxler, 2014). In this paper we present a conceptual framework for SUT that integrates these perspectives.

2. Research approach and methodology

In section 3, we integrate insights from existing literature regarding urban sustainability, sustainability transitions, urban development and SUT into a framework that defines SUT as a subset of urban sustainability transitions and consists of three complementary, interrelated and interacting components: 1) sustainable urban places and their sustainable management and usage, 2) the sustainability transition of the urban development regime towards culture, structure and practices that are aimed at sustainable urban development, and 3) urban sustainability transitions in related societal sectors. We simplify part of the inherent complexity of urban sustainability transitions (Nevens et al., 2013) by specifically relating to sustainable urban places. We incorporate regime dynamics, which are currently underexposed in literature (Hansen en Coenen, *in press*; Quitzau et al., 2013; Hamann and April, 2013).

There is lack of consensus on what sustainability is in an urban context (Klein Woolthuis et al., 2013; Vojnovic, 2014). We build upon the broad definition of Picket et al. (2013) that sustainability in an urban context not only encompasses processes of change and sustainable places, but also normative societal goals. This allows us to describe normative goals for both the urban development regime and sustainable urban areas. In this way we create a description of SUT that can be used as a point of reference, addressing the risk that ‘causalities arise primarily as an artefact of the way that transitions researchers have chosen to tell their stories’ (Coenen et al., 2012: 975). We then link it to the transition patterns described by De Haan and Rotmans (2011) and apply this conceptual framework to the Rijnhaven case in Rotterdam, The Netherlands. In this case, the municipality of Rotterdam issued a procurement for a sustainable urban transformation of the Rijnhaven area. The desired transformation is directly related to Rotterdam’s sustainability transition program, resulting in transition goals for the area itself and for the process by which it should be developed. Also, a large part of the area is water, which enables floating development transition initiatives. The procurement failed, and improved understanding of the transformation process is needed to prevent such failure in the future.

The Rijnhaven case is described in section 4. We base this description on the explorative study of the Rijnhaven development performed on behalf of the Clean Tech Delta, a Dutch cooperation of

private companies, knowledge institutes and local governments. That study is based on document studies, secondary public sources and secondary data from published studies regarding Rijnhaven, cross-validated by semi-structured interviews with stakeholders from the municipality, private companies and knowledge institutes involved in the Rijnhaven development (Ernst, 2014). In section 5 we apply the conceptual framework to the Rijnhaven case, creating a verifiable transition story and subsequently relating the outcomes to existing literature on sustainability transitions. In section 6, we draw conclusions on the conceptual framework and its application to the Rijnhaven case. In section 7 we discuss some considerations regarding this paper.

By presenting this framework we hope to deepen the understanding of SUT. Applying the framework to the Rijnhaven transformation contributes to the evaluation of the Rijnhaven development and adds empirical insights to the on-going research on urban sustainability transitions. We hope these insights will contribute to sustainability transitions in Rotterdam and cities worldwide.

3. Sustainable urban transformation

3.1. A subset of urban sustainability transitions

Transitions can relate to a manifold of societal systems, for example “energy supply, transport, agriculture, healthcare, geographic regions, ecological systems, policy systems, political, legislative and judicial systems, social-security systems, financial systems and education systems” (De Haan and Rotmans, 2011: 92), that fulfill societal functions like “transportation, communication, housing, energy supply, feeding” (Geels, 2005b: 1). Societal functions are fulfilled by regimes, which are semi-coherent sets of rules carried by different social groups, that provide orientation and coordination to the activities of relevant actor groups and create a dynamic stability of socio-technical configurations. Regimes are embedded within landscapes, and niches are embedded within regimes (see Fig. 1). The landscape contains deep structural trends of a heterogeneous set of technology-external factors. Niches generate and offer protection to radical innovations (Geels, 2002).

A transition encompasses fundamental change of a regime’s culture, structure, and practices (Loorbach, 2007). Culture consists of values, norms and ethics of actors that underlie their patterns of behavior and actions. Structures are standardized routines, rules and laws of the societal system. The resources, physical entities and artifacts produced by the material component are labeled the practices of actors (Frantzeskaki and De Haan, 2009).

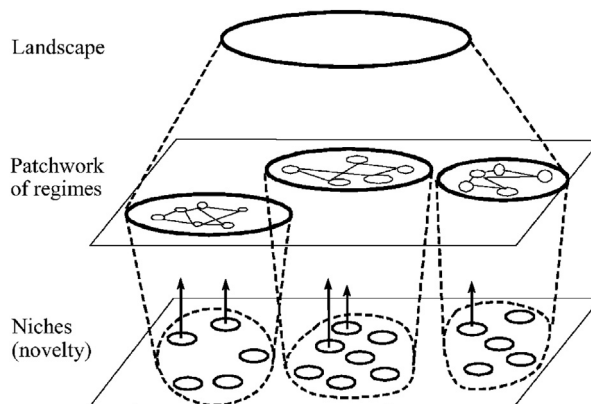


Fig. 1. The multi-level perspective (Geels, 2002: 1261).

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